

Error Reports in the Light of Error Management Climate, Task Complexity and Personnel Composition

Marco Haid^{1†}, Sabine Grascitz², Peter Heimerl³

^{1,3}UMIT - Private University for Health Sciences, Medical Informatics and Technology, Eduard-Wallnöfer-Zentrum 1, 6060 Hall in Tirol, Austria

²University of Innsbruck, Universitätsstraße 15, 6020 Innsbruck, Austria

ARTICLE INFO

Article History

Received 02 December
2019;

Accepted 30 January 2020

JEL Classifications

M40, M42

ABSTRACT

Purpose:

This study examines the impact of error management climate, task complexity and personnel composition on the willingness to report errors in audit firms. A high willingness to report errors enables the proper conduction of an audit and is associated with higher organizational performance.

Design/methodology/approach:

We use a mixed-subject case-based experiment to gain data for the examination. A total of 53 certified Austrian and German auditors participated in the experiment. For the data analysis, we use descriptive statistics and nonparametric test procedures to investigate significant differences.

Findings:

The results indicate that a proper error management climate is the most important factor for the willingness to report errors, which increases under an “error-tolerant” error management climate. The impact of the error management climate is independent of the task complexity and the personnel composition in which the error occurred.

Research limitations/implications:

The use of other methods and approaches to manipulate and operationalize the variables may lead to different results.

Originality/value:

This study contributes to the growing body of literature on error management climate. The analysis of the influence of task complexity and personnel composition on the willingness to report errors offers new insights into the impact and significance of error management climate in audit firms.

Keywords:

Error Management Climate,
Personnel Composition,
Error Report, Audit Quality,
Task Complexity

1. Introduction

The purpose of auditing is to ensure that the financial information has been prepared in accordance with the relevant legal framework. Therefore auditors aim to identify any material misstatements in financial statements. During the audit process, errors can occur on the part of the auditors. These errors may lead to misstatements not being detected. As the accuracy of the audit process is of severe relevance for the audit quality, it is incredibly relevant to know which factors affect the audit team members’ willingness to report (hereinafter referred to as WTR) such errors. Specifically, in audit firms, the WTR should be high, as otherwise, high liability claims could lead to seriously high costs. So it is essential to create a motivating environment for the employees (e.g. Herzberg, 1968 or Steven, 2013) to increase their WTR. As reporting errors may cause severe costs (e.g. damaged reputation or increasing work effort), individuals consider a trade-off between costs and benefits of an error report (Zhao and Olivera, 2006).

Error management is especially designed to handle errors quickly and efficiently in order to reduce potential losses and damages (Li, 2016). Error management climate (hereinafter referred to as EMC) is a critical factor for the individual’s WTR. The EMC is the attitude of an organization concerning errors made by their members (e.g. Gold

[†] Corresponding Author: Marco Haid
Email: marco.haid@umit.at

et al., 2014; Seckler et al., 2017). It mainly includes organizational error related methods, practices, and procedures (Li, 2016).

Task complexity is a crucial factor that influences audit quality and assessments made throughout the audit process (Bonner, 2008). Task complexity decisively determines the necessary resources and the necessary audit intensity (Bonner, 2008; Pummerer et al., 2013). Previous research examined the impact of the error type (mechanical vs. conceptual errors) on the WTR. Thus far, however, there is no study on the influence of task complexity on the WTR.

Joint-audits are discussed intensively with regard to audit quality and the audit process (e.g. Cameran et al., 2017; Baldauf and Steckel, 2012). As joint-audits and teamwork are becoming more and more common, errors may occur in different personnel compositions. So far, different studies examined the effect of the error originator (own vs. peer error, often called “whistleblowing”) on the WTR. Until now, however, no study has dealt with errors committed in different personnel compositions with shared responsibility.

Due to these insights, we aim to analyze the impact of (1) EMC, (2) task complexity, and (3) the personnel composition on the auditor’s WTR. We pay particular attention to the overall effect of EMC. Hence, the following research questions occur:

RQ 1: How does the error management climate (EMC) affect the willingness to report (WTR) in audit firms?

RQ 2: How does task complexity affect the willingness to report (WTR) in audit firms under different error management climates (EMC)?

RQ 3: How does the personnel composition affect the willingness to report (WTR) in audit firms with diverse EMC?

The study should lead to a better understanding of the impact of the EMC, task complexity, and different personnel compositions on the auditor’s WTR. Therefore, our contribution aims to identify existing differences in the WTR between self-made errors and joint errors in small and large teams towards task complexity and the EMC. The results should help to improve organizational structures in audit firms. Seckler et al. (2017) show that various levels and measures are needed to provide a suitable error management climate. This is also a link, our study refers to, as we analyze the effects of different factors. Further our paper brings new insights to the behavioral literature on error management climate by elaborating on the complementing and supplementing effects of task complexity and personnel composition.

The remainder of the paper is structured as follows: After the introduction, where the problem statement, the research motivation as well as the research questions are presented, a literature review with the development of the hypotheses on the covered topics is following. Afterwards, the research method and design, as well as the results, are described and discussed. The last section contains the conclusion and discussion of the findings.

2. Literature Review and Development of Hypotheses

2.1 Error Management Climate

Literature on error management from different disciplines consents that errors and their management are crucial to understand the quality of work (Seckler et al., 2017).

An error is defined as the unintentional deviation behavior from the original plans, objectives, rules or standards (Keith and Frese, 2011; Frese and Keith, 2015). Generally, preventing and handling errors is an important task to be fulfilled by the auditor and therefore is important for the auditor’s daily work (Seckler et al., 2017). In addition to handling errors, error management also contributes to the further development (learning from errors) and prevention of possible future errors (Li, 2016; Homsma, 2009; Frese et al. 1991). The EMC, as part of the organizational climate, is determined by the behavior and the treatment of an organization with errors of its members. In addition to the visible and outward value concept system, EMC also includes an internalized atmosphere (Li, 2016). Van Dyck et al. (2005) define EMC as the sum of norms and common practices regarding the organizational treatment of errors. They classify EMC into error management culture and error avoidance culture. Gold et al. (2014) have a similar approach and divide EMC into “open oriented” and “blame oriented”. An open oriented or error-tolerant (hereinafter referred to as “high”) EMC tolerates errors and accepts them as normal, humanly and an opportunity for further development. By contrast in a blame oriented or error-averse (hereinafter referred to as “low”) EMC, errors are attributed to incompetence and lead to blame and incomprehension (e.g. Gold et al., 2019; Gold et al., 2014; van Dyck et al., 2005).

Seckler et al. (2017) developed a multi-level model of error management and identify error management activities on the organizational, the team and the individual level. According to their model, a firm’s error management is dependent on organizational structures, the prevention procedures and resilient practices on the team level as well as the individual’s error orientation. They suggest considering the role of formal error prevention and the role of information error resilience as well as their interaction. Hence, various levels and measures are needed to provide a suitable error management climate. This is also a link, our study refers to, as we analyze the effects of different factors.

Non-audit related studies show a positive effect of EMC on the organizational performance (Wang, 2000), on the employee innovative behavior (Zhu and Pei, 2014), and on the knowledge socialization and internalization (Ma, 2015). Kaptein (2011) links a positive organizational climate to a high WTR. Gold et al. (2014) and Gronewold et al. (2013) show that the WTR increases when the EMC is error-tolerant (“high”). Hence, we develop the following hypothesis:

H1: If the EMC is error-tolerant (high), the WTR increases.

2.2 Task Complexity

In addition to person-specific and environmental-specific factors, task complexity in particular influences the quality, difficulty, and effectiveness of the audit process (Bonner, 2008; Stuart et al., 2012; Mala and Chand, 2015). Increasing task complexity harms the judgment performance of the auditor and requires a higher use of resources in order to achieve a corresponding audit quality (Haid, 2018; Bonner, 2008).

Due to the significant impact of task complexity on the audit, the question arises whether it also influences the WTR. So far, studies have concentrated only on the impact of the error type on the WTR. In this regard, Gold et al. (2014) used the categorization of Ramsay (1994) and divided errors in “mechanical” and “conceptual” errors. Mechanical errors relate to deviations from accuracy or completeness, and conceptual errors relate to complex, subjective, significant matters and the accuracy of the audit work as a whole (Gold et al., 2014; Ramsay, 1994). Gold et al. (2014) assume that in an open EMC, the superior is unlikely to invoke sanctions or attribute the error to incompetence. By contrast, a conceptual error might lead the superior assigning easier tasks to the auditor in order to gain more experience. The auditor may perceive this consequence as “punishment-like” and may, therefore, be worried about reporting a conceptual error (Gold et al. 2014). The results of the study by Gold et al. (2014) show that a high EMC results in an increase in the WTR of mechanical errors, but not to an increase of conceptual errors.

Based on the argumentation of Gold et al. (2014) regarding the influence of the error type on the WTR, we assume that errors occurred under a very complex situation can be assigned to inherent auditor incompetence, whereas errors under a situation with low complexity can be more assigned to sheer carelessness or inattentiveness. While the report of an error that has occurred in a simple task can lead to calls for mindfulness, the report of an error in high complex tasks can lead to degradation or mandatory additional training to withstand complexity in the future. Hence, reporting an error made in a high complex task may cause more costs than in a low complex task which leads us to the following hypothesis:

H2a: Increasing task complexity leads to a lower WTR.

Following the results of previous studies (e.g. Gold et al., 2019; Gold et al. 2014; Gronewold et al., 2013; van Dyck et al., 2005), we further assume that a high EMC increases the WTR of errors that occur in both highly complex and low complex tasks. Hence, we develop the following hypothesis:

H2b: If the EMC is error-tolerant (high), the WTR increases in highly complex and low complex tasks.

2.3 Personnel Composition

Previous studies find that the error origin affects the WTR. The study by Gold et al. (2014) examines the effect of the EMC on the WTR of errors caused by different error originators. It is examined whether the WTR of own errors differs from the WTR of errors made by other people (peer error). The results show that a high EMC increases the WTR of peer errors. Rathert and May (2007) find that individuals feel more comfortable when reporting self-made errors than reporting peer’s errors. Miller and Thomas (2005) show that the WTR is the lowest if they were committed by fellow team members. Teams consisting of members with equal positions tend to share the responsibility. Cameran et al. (2017) synthesize a broad body of literature and point out the relevance of auditing teams, their efficiency, dynamics and management for audit quality. That means, research on personnel composition is able to identify factors of how to improve audit quality.

Based on the different results of former studies on the influence of the error originator on the WTR, we assume that different personnel compositions have no impact in this respect. However, following the results of Gold et al. (2014), we assume that a high EMC will have a positive effect on the WTR in different personnel compositions, which leads us to the following hypotheses:

H3a: The personnel composition does not influence the WTR.

H3b: If the EMC is error-tolerant (high), the WTR increases for (a) self-made errors (b) joint errors of a small team and (c) joint errors of a large team.

3. Research Design

3.1 Research Method

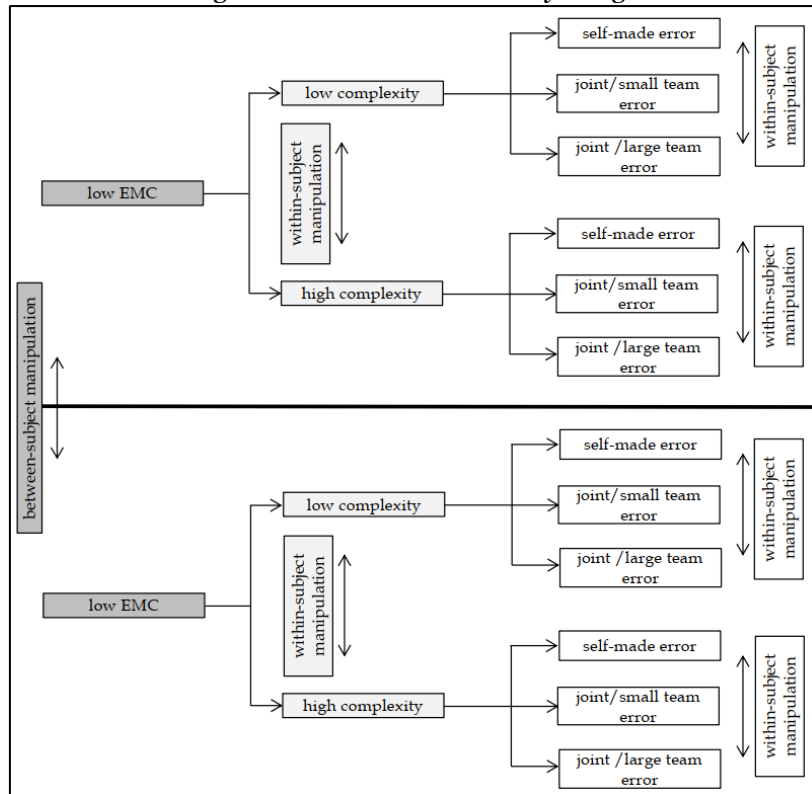
The empirical examination of the impact of the EMC, task complexity and the personnel composition on the WTR requires the measurement of all variables involved. We use a laboratory experiment to test the hypotheses. The choice of the research method enables us to control each variable and to measure the impact on the WTR in a standardized setting. This method seems to be most suitable as we can observe individual’s behavior in various situations, and it allows the identification of cause-effect-relationships. Furthermore, the direct measurement of the variables enhances construct validity compared to archival studies. Concerning the use, challenges and constraints of experimental accounting and auditing research see, e.g. Stefani (2003), Libby et al. (2002) or Smith (2011).

3.2 Study Design

We conduct the laboratory experiment in a 2x2x3 mixed-subject design to examine the impact of the EMC, the task complexity and the personnel composition on the WTR. Thus, the independent variables are the EMC, the task complexity and the personnel composition. The WTR is the dependent variable. We manipulate the EMC (low vs. high) between-subject; the task complexity, and the personnel composition were manipulated within-subject. The participants are randomly assigned to one of the EMC groups (low vs. high). The WTR of all participants is then

measured both in the low complexity manipulation and in the high complexity manipulation, each under three different personnel compositions (self-made, joint/small team and joint/large team error). Hence, we perform six measurements of the WTR per participant. Figure 1 illustrates the study design.

Figure 1: Overview of the study design



Hence, the participants are divided into two EMC groups (low vs. high); and the WTR of all participants is measured six times.

3.3 Data Collection and Manipulation Check

The experiment is divided into three parts. Part 1 contains the description of a fictitious audit firm. The participants work for this firm in the experiment. Part 2 consists of several scenarios in which errors have occurred. The WTR of the participants is measured in each of these scenarios. In the last part, we perform manipulation checks and collect demographic data.

The research design was pre-tested several times with students as participants before it was finalized. Data collection was carried out between 2016 and 2018. We use the data collection period and questions regarding the audit procedure as control variables. Manipulation checks are used to check whether the manipulation of the independent variables is recognized by the participants. The experiment was conducted using an online survey.

3.4 Participants

We have collected a total of 59 data sets. Six had to be excluded due to missing data. In order to ensure that the participants received and understood the information and descriptions correctly, manipulation checks were carried out on the EMC, the task complexity, and the personnel composition. All participants have passed the manipulation checks. In total, 53 valid data sets are used for the analysis.

The participants of the study are Austrian and German auditors with an active professional certification. Sixteen persons are female (30.19%), and 37 persons are male (69.81%). On average, the participants are 41.6 years old, and over 90 % (48 individuals) graduated from university. Thirty-six participants work for the Big Four. Twenty-nine participants were assigned to the high EMC and twenty-four to the low EMC.

3.5 Variables

3.5.1 EMC

For the operationalization of the EMC, we use the categorization and insights of Gold et al. (2014), Gronewold et al. (2013) and van Dyck (2005). We manipulate EMC (between-subject) using descriptions of two fictitious audit firms with different EMC. Thus, the participants receive either a description of a firm with low EMC in which errors are not tolerated or a description of a firm with high EMC, which tolerates errors and treats errors as an opportunity for development. We take the description of the two audit firms from the study by Gronewold et al. (2013). Table 1 contains the wording as it was used in our experiment.

Table 1: Manipulation of the EMC (Gronewold et al. 2013)

Low (error-averse) EMC	Open (error-tolerant) EMC
<p>The overall climate of your firm is noted for a “getting it right the first time” mentality that reflects the office managing partner’s own beliefs and actions.</p> <p>Errors in carrying out audit procedures are seen as signs of incompetence.</p> <p>You have seen top seniors coming from review meetings with managers and partners - after discussions about errors in files - almost in tears.</p> <p>Performance evaluations document such problems complicating possibilities for future promotion within the firm.</p>	<p>The overall climate of your firm is noted for an “open for improvement” mentality that reflects the office managing partner’s own beliefs and actions.</p> <p>Errors in carrying out audit procedures are seen as a natural part of learning.</p> <p>You have seen top seniors coming from review meetings with managers and partners - after discussions about errors in files - with a renewed determination to work harder next time.</p> <p>Performance evaluations do not document such Problems if the person does not repeat them or is making progress in addressing them, allowing possibilities for future promotion within the firm.</p>

The table above includes a description of the two different EMCs. Whereas the lower or error averse EMC is characterized by a “getting it right the first time” mentality, the open or error-tolerant EMC sees errors as a potential for improvement and essential part of learning.

3.5.2 Task Complexity

We manipulate the task complexity within-subject using descriptions of two fictional tasks with different complexity levels.

A classification for complexity divides it into (1) a subjective experience, (2) an interchange from task- and person-specific aspects and (3) into an objective sphere wherein principle measurable criteria are crucial for the degree of complexity (Gill and Hicks, 2006; Campbell, 1988). The classification following the (1) subjective psychological experience treats complexity as a measure of the potential that the task is perceived as complex by the individual (Gill and Hicks, 2006; O’Donnel et al., 2005) or defines task complexity in terms of the task’s potential to induce a state of arousal or enrichment in the individual (Gill and Hicks, 2006; Nordquist et al., 2004). Besides this subjective view, the classification based on (3) objective characteristics aim at different task inherent (objective measurable) properties like the number of alternatives and attributes (Gill and Hicks, 2006; Fisher et al., 2003) or the complexity of the underlying systems or environment (Gill and Hicks, 2006; Funke, 1991). Another objective criterion is the degree of uncertainty, whereas the complexity is classified by the unpredictability of the outset of the task (Kishore et al., 2004).

For manipulation of the task complexity, we make use of the objective task characteristics (1) task size, (2) amount of information to be processed and (3) number of solution paths (Gill and Hicks, 2006; Fisher et al., 2003; Campbell, 1988). We vary these attributes in the fictitious tasks. Table 2 contains the manipulation of task complexity.

Table 2: Manipulation of the task complexity

Low Complexity	High complexity
<p>For the audit of the <u>medium-sized company</u> "Maier GmbH" with <u>one headquarters and two production halls</u>, you have to audit the conformity of the sums in the balance sheet to check the conformity whether values have been transferred correctly.</p>	<p>For the audit of the <u>big company</u> "Big Business AG" the completeness and the correct valuation of the provisions and liabilities have to be checked. The company has <u>14 subsidiaries</u>, 9 of them are <u>abroad</u>. Besides its <u>headquarters</u>, there are <u>seven branch offices for the management</u> of the company as well as <u>11 factory halls and seven stores</u></p>

For our experiment, we used the above-mentioned descriptions. Thereby we manipulate (highlighted: underlined) the company size, the legal form of the entity, the number of factories and branches, the number of subsidiaries and internationality. Additionally, the tasks to be carried out is described shortly (highlighted: bold).

3.5.3 Personnel Composition

The third independent variable is the personnel composition. We examine the impact of self-made errors, joint errors in a small team and joint errors in a large team. The variable is manipulated within-subject inspired by Gronewold et al. (2013) through information about the personnel composition. The wording used is included in Table 3.

Table 3: Manipulation of the personnel composition (inspired by Gold et al., 2014)

Self-made	Joint (small team)	Joint (large team)
<p>You do a part of the task alone. A bit of time after the completion, you notice an error.</p>	<p>You do a part of the task with a colleague. A bit of time after the completion, you notice an error. Both of you are equally responsible</p>	<p>You do a part of the task within a group of 6 people. A bit of time after the completion, you notice an error. Everybody in the team is</p>

	for it.	equally responsible for it.
--	---------	-----------------------------

Regarding the personnel composition, the participants were either working (1) alone, in (2) small teams or in (3) large teams. Errors that occurred were thereby either caused by (1) themselves (self-made error), (2) jointly by a team of two or (3) jointly by six people. This manipulation represents different personnel compositions that usually occur in auditing and may affect individual's WTR.

3.5.4 WTR

WTR is the dependent variable of interest. In line with former studies (e.g. Gold et al., 2014; Gronewold et al., 2013), we used the question, "Do you want to report the error to your supervisor?" to measure WTR. The variable WTR is measured using an 11-point Likert scale, which reached from "want to report the error" (1) to "do not want to report the error" (11).

4. Results

The characteristics of the collected data require nonparametric test procedures to investigate significant differences. Hence, we use the Mann-Whitney U test, the Wilcoxon rank-sum test, the non-parametric Friedman test (Janssen and Laatz, 2010). These tests compare data from different groups with each other and therefore show if the distribution is the same among the groups. The alpha value is 0.05 for all statistical tests. Regarding the dependent variable WTR, a lower number means a higher WTR.

4.1 Descriptive Statistics and Correlations

Table 4 shows the results of the descriptive statistics of the dependent variable WTR.

Table 4: Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
WTR	318	1.00	11.00	1.8239	1.47763

The average WTR across all 318 scenarios (6 scenarios x 53 participants) is relatively high at 1.824.

Table 5 summarizes the correlations between the dependent variable WTR and the independent variables EMC, task complexity, and personnel composition.

Table 5: Correlations (Spearman's Rho)

		EMC (1-OpenEMC; 2-lowEMC)	Task Complexity (1-lowTC; 2-highTC)	Personnel Composition (1-selfmade; 2- smallTeam; 3-largeTeam)
	Correlation Coefficient	0.321**	-0.029	0.036
WTR	Sig. (2-tailed)	0.000	0.604	0.519
	N	318	318	318

** . Correlation is significant at the 0.01 level (2-tailed)

There is a significant positive correlation between the WTR and the EMC.

4.2 EMC

Despite the generally high WTR across all 318 scenarios (Mean = 1.824), the WTR in the high EMC scenario (mean rank = 135.52) is significantly higher than the WTR in the low EMC scenario (mean rank = 188.48), $U = 8355.50$, $p = 0.00$, $d = 0.32$. Table 6 summarizes the results.

Table 6: Mann-Whitney U test (WTR all scenarios)

		Ranks		
	EMC	N	Mean Rank	Sum of Ranks
WTR	open EMC	174	135.52	23580.50
	low EMC	144	188.48	27140.50
	Total	318		
Test Statistics ^a				
	Mann-Whitney U		WTR	8355.500
	Wilcoxon W			23580.500
	Z			-5.722
	Asymp. Sig. (2-tailed)			0.000

a. Grouping Variable: EMC

In an open EMC, the overall WTR of the participants is significantly higher than in a low EMC. Hence, we support hypothesis H1. In the following sections, we examine whether the impact of EMC on the WTR will persist even with different levels of task complexity and different personnel composition.

4.3 Task Complexity

We use the responses to the WTR of “self-made” errors¹ to analyze the impact of task complexity. For the examination of significant differences between low and high complexity, we analyze both the group with the high EMC and the group with the low EMC. Table 7 contains the results:

Table 7: Wilcoxon signed ranks test (high complexity vs. low complexity)

		Ranks		
		N	Mean Rank	Sum of Ranks
highEMChighTC ^d – highEMClowTC	Negative Ranks	2	1.50	3.00
	Positive Ranks	1	3.00	3.00
	Ties	26		
	Total	29		
lowEMChighTC – lowEMClowTC	Negative Ranks	4	2.50	10.00
	Positive Ranks	0	0.00	0.00
	Ties	20		
	Total	24		
Test Statistics ^a				
		highEMChighTC – highEMClowTC	lowEMChighTC - lowEMClowTC	
Z		0.000 ^b	-1.841 ^c	
Asymp. Sig. (2-tailed)		1.000	0.066	

a. Wilcoxon Signed Ranks Test

b. The sum of negative ranks equals the sum of positive ranks.

c. Based on positive ranks.

d. TC = task complexity

No significant difference between low and high complexity could be found for the group with the high EMC ($Z = 0.000$, $p = 1.00$) and for the group with low EMC ($Z = -1.841$, $p = 0.066$). According to the results, task complexity has no significant impact on the WTR. Hence, we reject hypothesis H2a.

We further investigate whether the EMC has an influence on the WTR at different levels of task complexity. Data analysis shows that both, at high task complexity and low task complexity, a high EMC leads to a significantly higher WTR than a low EMC. Table 8 summarizes the results:

Table 8: Mann-Whitney U test (EMC and task complexity)

		Ranks			
		EMC	N	Mean Rank	Sum of Ranks
low task complexity	high EMC		29	22.69	658.00
	low EMC		24	32.21	773.00
	Total		53		
high task complexity	high EMC		29	23.16	671.50
	low EMC		24	31.65	759.50
	Total		53		
Test Statistics ^a					
		low task complexity	high task complexity		
Mann-Whitney U		223.000	236.500		
Wilcoxon W		658.000	671.500		
Z		-2.544	-2.283		
Asymp. Sig. (2-tailed)		0.011	0.022		

a. Grouping Variable: 1=openEMC; 2=lowEMC

For low task complexity the results indicate a significantly higher WTR (mean rank = 22.69) for a high EMC than for a low EMC (mean rank = 32.21), $U = 223.00$, $p = 0.011$, $d = 0.35$. Also with high task complexity, the WTR of a high EMC (mean rank = 23.16) is significantly higher than the WTR of a low EMC (mean rank = 31.65), $U =$

¹ The data analysis was also carried out with the responses to the WTR of errors made in small and large teams for control purposes. The analysis came to the same conclusion as the analysis of the WTR of self-made errors. Therefore, the influence of task complexity on WTR remains constant across different personnel compositions.

236.5, $p = 0.022$, $d = 0.31$. Thus, the effect of EMC remains with different task complexity. According to the results, we support hypothesis H2b.

4.4 Personnel Composition

To examine the impact of the personnel composition on the WTR we use the responses to the low task complexity scenarios². We investigate the relationship in both the high EMC and the low EMC scenario.

The data analysis for the high EMC shows a slightly higher WTR for self-made errors (mean rank = 1.91) than for joint small-team errors (mean rank = 2.02) and for joint large-team errors (mean rank = 2.07). However, according to the non-parametric Friedman test of differences among repeated measures, these differences are not significant, Chi-square = 4.667, $p = 0.097$. Table 9 summarizes the results:

Table 9: Non-parametric Friedman test (Personnel Composition (high EMC))

Mean Rank	
Self-made error	1.91
Small-team error	2.02
Large-team error	2.07
Test Statistics	
N	29
Chi-Square	4.667
Df	2
Asymp. Sig.	0.097

Table 10 contains the results of the low EMC scenario. Also, in the low EMC scenario, the WTR of self-made errors is the highest (mean rank = 1.98). As in the high EMC scenario, the differences are not significant after the non-parametric Friedman test, Chi-square = 0.118, $p = 0.943$.

Table 10: Non-parametric Friedman test (Personnel Composition (low EMC))

Mean Rank	
Self-made error	1.98
Small-team error	2.02
Large-team error	2.00
Test Statistics	
N	24
Chi-Square	0.118
df	2
Asymp. Sig.	0.943

As predicted, data analysis shows no significant impact of the personnel composition on the WTR. Thus, we support hypothesis H3a.

We further analyze the impact of the EMC on the WTR in different personnel compositions. The results are shown in Table 11:

Table 11: Mann-Whitney U test: EMC and different personnel compositions

	Ranks			
	EMC	N	Mean Rank	Sum of Ranks
Self-made error	high EMC	29	22.69	658.00
	low EMC	24	32.21	773.00
	Total	53		
Small-team error	high EMC	29	22.53	653.50
	low EMC	24	32.40	777.50
	Total	53		
Large-team error	high EMC	29	22.90	664.00
	low EMC	24	31.96	767.00
	Total	53		
Test Statistics ^a				
	Self-made error	Small-team error	Large-team error	
Mann-Whitney U	223.000	218.500	229.000	
Wilcoxon W	658.000	653.500	664.000	

² The data analysis was also carried out with the answers of the high complexity scenario for control purposes. The analysis came to the same conclusion as the analysis of the low complexity scenario. Therefore, the influence of the personnel composition on WTR remains constant across different levels of task complexity.

Z	-2.544	-2.555	-2.348
Asymp. Sig. (2-tailed)	0.011	0.011	0.019

a. Grouping Variable: Personnel composition

Regardless of the personnel composition, a high EMC leads to significantly higher WTR. The Mann-Whitney U test shows significantly higher WTR values for self-made errors ($U = 223.00$, $p = 0.011$, $d = 0.35$), small-team errors ($U = 218.50$, $p = 0.011$, $d = 0.35$) and large-team errors ($U = 229.00$, $p = 0.019$, $d = 0.32$) in the high EMC group. Taken these insights together, we support hypothesis H3b.

5. Conclusion

The study examines the impact of the error management climate (EMC), task complexity, and the personnel composition on the auditors' willingness to report errors (WTR). In accordance with previous studies (Gold et al., 2014; Gronewold et al., 2013; Kaptein, 2011), we find that an open EMC leads to a significantly higher WTR than a low EMC. In addition, we show that this effect remains constant even with different task complexity or personnel compositions. Furthermore, the results provide evidence that task complexity does not affect the WTR. Contrary to our predictions, there is no difference between the WTR of errors occurring in high complex or low complex tasks. Thus, the error type (Gold et al., 2014; Gronewold et al., 2013) and not the complexity of the task in which the error occurred is decisive for the WTR.

Although the data analysis shows that the WTR is highest for self-made errors, the differences to the WTR of joint-errors are not significant. Hence, the personnel composition has no significant impact on the WTR in so far as responsibility is shared.

The results lead to the conclusion that the EMC is substantially more important for the WTR than other influencing factors such as task complexity or personnel conditions. The implementation of an error-tolerant and effective EMC can counteract negative impacts on the audit process (e.g. task complexity) because errors are detected more quickly and potential losses and damages can be avoided. The positive effects (e.g. learning effect) of an error-tolerant EMC can lead to an increase in the overall quality of the audit process. This is in line with the broader scope of the newly drafted ED ISQM 1 (will replace ISQC 1) and the draft of ISA 220 (Revised).

It is plausible that some limitations might have influenced the results obtained. First, the manipulation of EMC was very obvious which, as discussed in previous studies (e.g. Gold et al., 2014), might lead to potential demand effects. Second, we used objective task characteristics for the manipulation of task complexity. Using different characteristics or different approaches regarding the operationalization may lead to different results. Finally, as in all experimental research papers, we are confronted with the usual caveats. Hence, in addition to a standardized introduction into the investigation, we included control variables (namely: age, sex, experience, education, Big4/non Big4, various control questions, duration) to control for potential threats to external and internal validity of the experiment (e.g. Smith, 2011).

The study has pointed out questions in need of further investigation. We suggest that future research should concentrate on individual characteristics and their influence on the WTR. In particular, risk preference, self-efficacy or experience should be mentioned here. Further research is also required to examine the impact of regulatory frameworks on the WTR. Besides in terms of personnel composition also the effects of different roles (juniors vs. seniors) could be of relevance to be further elaborated on. As Emby et al. (2019) show, also the in-team relationships between the acting people as well as the communication culture in these teams may affect their error reporting behavior. Hence, the personnel composition might be of interest to be analyzed in more depth. Further, also the liability situation would be particularly interesting in this context. Besides, the impact of incentives and remuneration on the WTR might provide an important area for future research.

References

- Baldauf, J., and Steckel, R., 2012, "Joint Audit and Accuracy of the Auditor's Report: An Empirical Study", *International Journal of Economic Sciences and Applied Research*, 5, 2, pp. 7 - 42.
- Bonner, S., 1994, "A model of the effects of audit task complexity", *Accounting, Organizations and Society*, 19, pp. 213 - 234.
- Bonner, S., 2008, *Judgment and Decision Making in Accounting*, Pearson/Prentice Hall, Upper Saddle River, N.J.
- Cameran, M., Detillo, A., and Pettinicchio, A., 2017, *Auditing teams - Dynamics and Efficiency*, Routledge Taylor & Francis Group, London and New York.
- Campbell, D., 1988, "Task Complexity - A Review and Analysis", *Academy of Management Review*, 13, pp. 40 - 52.
- Emby, C., Zhao, B., Siewke, J., 2019, "Audit Senior Modeling Fallibility: The effects of reduced error strain and enhanced error-related self-efficacy on audit juniors' responses to self-discovered errors", *Behavioral Research in Accounting*, 31, 2, pp. 17 - 30.
- Fisher, C. W., Chengalur-Smith, I. and Ballou, D. P., 2003, "The impact of experience and time on the use of data quality information in decision making", *Information systems research*, 14, pp. 170 - 188.
- Frese, M., and Keith, N., 2015, "Action Errors, error management and learning in organizations", *Annual Review of Psychology*, 66, 1, pp. 661 - 687.
- Gill, T. G. and Hicks, R. C., 2006, "Task Complexity and Informing Science: A Synthesis", *Informing Science*, 9, pp. 1 - 30.

- Gold, A., Gronewold, U. and Salterio, S., 2014, "Error management in audit firms: Error climate, type, and originator", *The accounting review*, 89, pp. 303 – 330.
- Gold, A., van Mourik, O., Wallage, P., & Wright, A., 2019, "Auditor Errors: Avoid Like the Plague or a Learning Opportunity?", available at SSRN 3395273.
- Gronewold, U., Gold, A. and Salterio, S., 2013, "Reporting Self-Made Errors: The Impact of Organizational Error-Management Climate and Error Type", *Journal of Business Ethics*, 117, 1, pp. 189 – 208.
- Haid, M. (2018): *Information, Haftung und Prüfungsqualität*, Springer Gabler, Wiesbaden.
- Herzberg, F., 1968, "One more time: How do you motivate employees?", *Harvard Business Review*, pp. 87 – 96.
- Homsma, G., Van Dyck, C., De Gilder, D., Koopman, P. and Elfring, T., 2009, "Learning from error: the influence of error incident characteristics", *Journal of Business Research*, 62, 1, pp. 115 – 122.
- Janssen, J. and Laatz, W., 2010, *Statistische Datenanalyse mit SPSS - Eine anwendungsorientierte Einführung in das Basissystem und das Modul Exakte Tests*, 7., Springer, Berlin.
- Kaptein, M., 2011, "From inaction to external whistleblowing: The influence of the ethical culture of organizations on employee responses to observed wrongdoing", *Journal of Business Ethics*, 98, 3, pp. 513 – 530.
- Keith, N., and Frese, M., 2011, "Enhancing Firm Performance and Innovativeness through Error Management Culture", *Handbook of Organizational Culture and Climate*, 9, pp. 137 – 157.
- Kishore, R., Agrawal, M. and Rao, H. R., 2004, "Determinants of sourcing during technology growth and maturity: An empirical Study of e-Commerce sourcing", *Journal of management Information Systems*, 21, 3, pp. 911 – 946.
- Li, L., 2016, "An Overview of Error Management Climate", *Psychology*, 7, 4, pp. 623 – 626.
- Libby, R., Bloomfield, R. and Nelson, M. W., 2002, "Experimental research in financial accounting", *Accounting, Organizations and Society*, 27, pp. 775 – 810.
- Ma, L., 2015, "Error Management Climate, Knowledge Transformation and Study of the Relationship between the Ability of the Staff", *Chongqing University of Posts and Telecommunications*.
- Miller, D. and Thomas, S., 2005, "The impact of relative position and relational closeness on the reporting of unethical acts", *Journal of Business Ethics*, 62, 4, pp. 315 – 328.
- O'Donnel, E., Koch, B. and Boone, J., 2005, "The influence of domain knowledge and task complexity on tax professionals' compliance recommendations", *Accounting, Organizations and Society*, 30, pp. 145 – 165.
- Pummerer, E., Steller, M. and Baldauf, J., 2013, „Prüfungsqualität, Prüferhaftung und Risiko-aversion: Eine analytische Betrachtung der Bedeutung der Risikoaversion für die Prüfungsqualität“, *Zeitschrift für betriebswirtschaftliche Forschung*, 65, pp. 32 – 59.
- Ramsay, R. J., 1994, "Senior/manager differences in audit workpaper review performance", *Journal of Accounting review*, 32, 1, pp. 127 – 135.
- Rathert, C., May, D.R., 2007, "Health care work environments, employee satisfaction, and patient safety: care provider perspectives", *Health Care Management Review*, 32, 1, pp. 2 – 11.
- Seckler, C., Gronewold, U., and Reihlen, M., 2017, "An error management perspective on audit quality: Toward a multi-level model", *Accounting, Organizations and Society*, 62, pp. 21 – 42.
- Smith, M., 2011, *Research Methods in Accounting*, Sage Publications, London.
- Stefani, U., 2003, "Experimente als Forschungsmethode im Prüfungswesen“, Richter, M., *Entwicklungen der Wirtschaftsprüfung : Prüfungsmethoden - Risiko - Vertrauen*, Erich Schmidt, Bielefeld, pp. 243 – 275.
- Steven, K. (2013): Anreize für gute Leistungen: Wie motiviert man Mitarbeiter?. *Wissensmanagement*, 2, pp. 46 - 47.
- Stuart, I. and Prawitt, D., 2012, "Firm-Level Formalization and Auditor Performance on Complex Tasks", *Behavioral Research in Accounting*, 24, 2, pp. 193 – 210.
- Tan, H.-T., Ng, T. B.-P. and Mark, B. W.-Y., 2002, "The effects of task complexity on auditors' performance: The impact of accountability and knowledge", *Auditing: A Journal of Practice and Theory*, 21, 2, pp. 81 – 95.
- Van Dyck, C., 1997, "Error climate and management issues: Its links to organizational performance", Buelens, A., Vinkenburg, C., Pepermans, R. and Jansen, P., *Managerial behaviour and practices*, The Netherlands: Acco, Amersfoort, pp. 107 – 116.
- Van Dyck, C., Frese, M., Baer, S. and Sonnentag, S., 2005, "Organizational error management culture and its impact on performance: a two-study replication", *Journal of Applied Psychology*, 90, pp. 1228 – 1240.
- Wang, C. H., 2000, "Study on the Relationship between Error Management Climate and Organizational Effectiveness", *Journal of Zhejiang University: Humanities and Social Sciences Edition*, 30, pp. 114 – 119.
- Zhao, B. and Olivera F., 2006, "Error Reporting in Organizations", *The Academy of Management Review*, 31, 4, pp. 1012 – 1030.
- Zhu, Y. J., and Pei, Y., 2014, "Error Management Culture, Effect of Psychological Empowerment on Employee Innovative Behavior: Creative Self-Efficacy Moderating Effect", *China Human Resources Development*, 17, pp. 23 – 29.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Licence

